

INVITED TALK

Presented at the International Conference on
Surface Modification of Material by Ion Beams (SMMIB)

Kusadasi, Turkey, September 4-9, 2005

Energetic Condensation of Metal Plasmas

André Anders

Lawrence Berkeley National Laboratory, University of California,
1 Cyclotron Road, Berkeley, California 94720-8223

Abstract: January 2, 2005

Corresponding Author:

André Anders
Lawrence Berkeley National Laboratory
1 Cyclotron Road
Berkeley, CA 94720-8223
Tel. (510) 486-6745
Fax (510) 486-4374
e-mail aanders@lbl.gov

Energetic Condensation of Metal Plasmas

André Anders

Lawrence Berkeley National Laboratory, University of California,
1 Cyclotron Road, Berkeley, California 94720-8223

Metal plasmas play a special role in the formation of coatings because metal ions are condensable (film forming) and bias can be efficiently applied. In contrast to conventional ion-beam-assisted deposition, no external ion (beam) source is needed, and substrate bias is acting directly on film-forming species. Both ion implantation and deposition has been demonstrated. Related techniques are discussed, known as ion plating (IP), arc-bond-sputtering (ABS), and metal plasma immersion ion implantation and deposition (MePIIID). Metal plasmas obtained by filtered cathodic vacuum arcs (FCVA) and by high-power pulsed sputtering (HPPS, also HIPIMPS) are of special interest. Using these techniques, special features can be utilized, including substrate-film interface tailoring, film densification, and stress control. Attention should be paid to less-than-one sticking coefficient and non-zero self-sputter yield, which will be explained. Such features are of great importance to nano-size filling of three-dimensional structures and to ion-neutral interaction in the plasma, affecting ion charge states and the energy of ions arriving at the substrate.